PAJ

TI - METHOD FOR DE[redacted]TING MAGNETIC MARKER

AB - PURPOSE:To identify the kind or quantity of an article by a small sized device without using a detection coil by a method wherein the impedance of an exciting circuit is set so as to be smaller than that of a magnetic fine wire and the change of magnetic flux is detected on the basis of the change of the current waveform of an exciting coil.

- CONSTITUTION:A detection resistor 9 is connected across an exciting coil 5 and an AC power supply 6 and both ends thereof are connected to a measuring device 8 and the internal impedance of the power supply 6, the value of the resistor 9 and the impedance of the coil 5 are set so as to be smaller than the impedance of a magnetic fine wire so that an exciting current changes in the circuit through which the exciting current flows by the presence of a magnetic marker 1. By this constitution, since the exciting current changes by the change of magnetic flux due to the coercive force of the magnetic fine wire, a detection signal can be taken out by subtracting the differential waveform of an exciting power supply from the waveform change of the current or the differential waveform of said current. Since no detection coil is used at this time, a device becomes simple and a small-sized device can be constituted corresponding to a use purpose such as the identification of a small article 2.

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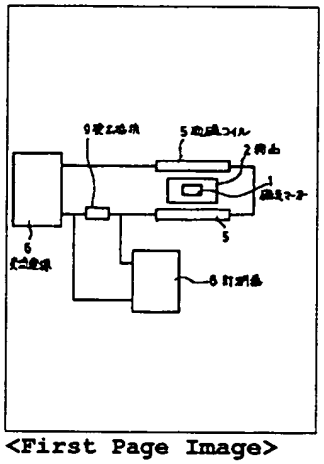
PA - FUJI ELECTRIC CO LTD
IN - KATSUYAMA TERUSHI; others: 01
I - G01V3/10 ;G06M7/00



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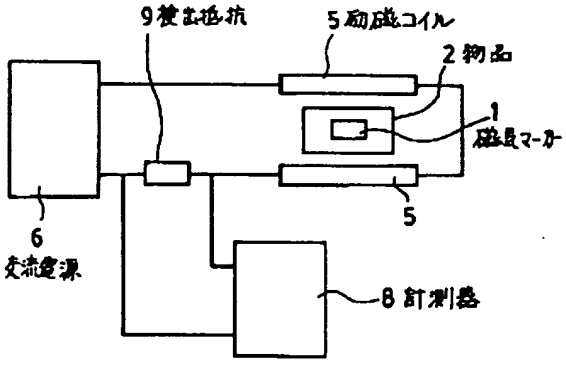
(54)【発明の名称】　磁気マーカーの検出方法

(57)【要約】

【目的】物品識別装置の検出コイルを用いることなく、励磁コイルの電流変化から磁気マーカーの磁束変化を検出する。

【構成】検出コイルを用いずに、励磁回路部のインピーダンスを磁性細線のインピーダンスより小さく設定し、磁気マーカーの各磁性細線の保磁力での磁束変化により励磁電流を変化させ、この電流波形変化、またはこの電流の微分波形から励磁電源微分波形を差し引いて、これを検出信号とする。



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【特許請求の範囲】

【請求項１】磁気ヒステリシス曲線が角型を示し互いに保磁力の異なる複数本の磁性細線を有する磁気マーカーを交流励磁し、各磁性細線の磁束変化を検出するに当たり、交流電源、検出抵抗、励磁コイルからなる励磁回路を用いて、そのインピーダンスを磁性細線のインピーダンスより小さく設定しておき、励磁コイルの電流波形変化から磁束変化を検出することを特徴とする磁気マーカーの検出方法。

【請求項２】磁気ヒステリシス曲線が角型を示し互いに保磁力の異なる複数本の磁性細線を有する磁気マーカーを交流励磁し、各磁性細線の磁束変化を検出するに当たり、交流電源、検出抵抗、励磁コイルからなる励磁回路を用いて、そのインピーダンスを磁性細線のインピーダンスより小さく設定しておき、励磁コイルの電流波形変化を微分した波形から励磁電源微分波形を差し引いて磁束変化を検出することを特徴とする磁気マーカーの検出方法。

【請求項３】請求項２記載の方法を行なうに当たり、励磁回路部に励磁コイルと同等のインピーダンスを有する補償コイルを接続して励磁電流波形を補償することを特徴とする磁気マーカーの検出方法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は物品に取り付けてその物品の種類や数量を識別する磁気マーカーの検出方法に関する。

【０００２】

【従来の技術】磁気マーカーを取り付けた物品を交流磁界中を通過させ、磁気マーカーに発生する磁束による誘起電圧をコイルで検出して、物品の種類を識別する方法が知られている。図１０は磁気マーカーを用いた物品識別装置の一例として、同一出願人から特願平２－１５３２７４号により出願中の装置について、その要部構成を斜視図で示した模式図である。図１０において、磁気マーカー１を取り付けた物品２が二つの滑車３に張られているベルト４上にあり、物品２は磁気マーカー１とともに、滑車３の回転によって走行するベルト４上で矢印方向に移動する。ベルト４の走行途上に、ベルト４を両側から挟むように二つの励磁コイル５を配置してあり、これら励磁コイル５は交流電源６に接続されている。二つの励磁コイル５に挟まれているベルト４の近傍に設けた複数個の検出コイル７が計測器８に接続される。物品２とともにベルト４上を走行する磁気マーカー１が、励磁コイル５から発生する交流磁界によって磁束が変化する。その磁束変化を検出コイル７に生ずる誘起電圧として取り出し、これを計測器８で処理して物品２の識別を行なうものである。

【０００３】磁気マーカー１としては、磁気ヒステリシス曲線が角型で大バルクハウゼン効果を有する非晶質磁

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性合金の細線を使用するのが適している。磁気マーカー１は、保磁力の異なる複数本の磁性細線を、例えばプラスチックなどに固定して用いる。各磁性細線は、励磁コイル５による磁界が保磁力の値になった時間で磁束が急激に反転して、検出コイル７にパルス状の電圧が誘起する。この誘起電圧から物品２の種類や数量を識別することができる。

【０００４】

【発明が解決しようとする課題】以上の如く、非晶質磁性合金細線の磁気マーカーを用いて物品を識別する方法は有用なものであるが、磁気マーカーに生ずる磁束をコイルで検出する方法では、図１０に示したように、励磁コイル５の他に検出コイル７を必要とし、さらに検出コイル７の取り付け位置や方向を適切に決めなければならないので、装置全体を非常に複雑なものとしている。したがって、物品識別装置の使用目的によっては、例えば小さな物品に適用するときなど、検出コイル７を省略しコンパクトな装置とし、これに適した磁気マーカーの検出方法を用いることが望ましい。

【０００５】本発明は上述の点に鑑みてなされたものであり、その目的は、検出コイルを用いることなく、磁気マーカーによる励磁コイルの電流変化分から、物品を識別することが可能な磁気マーカーの検出方法を提供することにある。

【０００６】

【課題を解決するための手段】上記の課題を解決するために、本発明の方法は、検出コイルを用いずに、励磁回路部のインピーダンスを磁性細線のインピーダンスより小さく設定し、磁気マーカーの各磁性細線の保磁力での磁束変化により励磁電流を変化させ、この電流波形変化、またはこの電流の微分波形から励磁電源微分波形を差し引いて、これを検出信号とするものである。

【０００７】

【作用】磁気マーカーの各磁性細線の保磁力で磁束が変化している時間帯では、励磁電流はほぼ一定で小さな段状になり、他の時間帯では励磁電源波形と同じになるので、段状波形の有無から物品を識別することができ、また、励磁電流の微分波形は、保磁力で磁束変化している間は、零に向かって小さくなり、磁束変化がなくなると元の値に戻りパルス状に変化する。この微分波形から励磁電源波形分を除くことにより、磁気マーカーに適したパルス状の電圧を得て、このパルス状電圧から物品の識別が可能となる。

【０００８】

【実施例】以下、本発明の方法を実施例に基づき説明する。本発明の方法を適用する物品識別装置の構成を模式図として図１に示し、図１０と共通部分を同一符号で表わしてある。磁気マーカー１，物品２，ベルト４などは図１０と同じであるが、図１では励磁コイル５と交流電源６との間に、検出抵抗９を接続し、その両端を計測器

8に接続している。励磁電流が流れる回路は、磁気マーカー1の有無により励磁電流が変化するように、交流電源6の内部インピーダンス，検出抵抗9の値，励磁コイル5のインピーダンスを磁性細線のインピーダンスより小さく設定しておく。

【0009】磁気マーカー1に用いる磁性細線は、互いに保磁力の大きさの異なるものを、できるだけ多く用いる方が識別物品の数を増すことができるが、ここでは、説明を簡易にするため、保磁力の大きさが異なる3種類の磁性細線を用いた場合について述べる。図2はこれら磁性細線の磁気ヒステリシス曲線図であり、それぞれ実線，点線，一点鎖線で表わしてある。H_a が磁界の最大値、H_1, H_2, H_3 が各磁性細線の磁性細線の保磁力である。

【0010】図3は磁気マーカー1が二つの励磁コイル5の間を通過する位置にあるときの時間帯の磁界波形図である。図3に示すように、保磁力$H_1(t_1)$，$H_2(t_2)$，$H_3(t_3)$で磁性細線の磁束が急激に変化するため、磁界即ち励磁電流はほぼ一定になり、小さな段状になる。図3中t_4, t_5, t_6 は、負側の保磁力$-H_1, -H_2, -H_3$ に対応する時間を表わし、正側と同様に波形は小さな段状を示す。この段状の有無を判別することにより物品識別が可能である。

【0011】また、以上の方法は計測器8が複雑になるのでこれを避け、検出精度の点からも図3の磁界波形を微分した形の検出信号とするのが有効である。そのときは、図1の装置に加えて、図4に示すように、検出抵抗9の両端から微分器10，励磁分補償器11，計測器8を直列に接続して用いる。ここで得られる波形、即ち図4の微分器10の出力は、図5の波形図に示すように、時間t_1, t_2, t_3 およびt_4, t_5, t_6 で零に向かってパルス状に変化する。図6は、図5の波形から磁気マーカー1がないときの波形分（ここでは正弦波）を、図4に示す励磁分補償器11で除いた波形図であり、時間t_1, t_2, t_3 およびt_4, t_5, t_6 でパルス状の電圧になり、識別信号として用いることができる。

【0012】図7は、検出相互誘導器12を用いて磁界（励磁電流）を微分し、図4の微分器10を使用しない場合の構成を示す模式図である。ただし、励磁コイル5，計測器8は図示を省略してある。検出相互誘導器12は、インピーダンスを小さくするため、一次側の抵抗値，リアクタンスをできるだけ小さくする必要がある。このときの出力は、図5に示した波形と同等になる。

【0013】以上のように、本発明の方法は、磁気マーカー1が励磁コイル5の間を通らないときの磁界分（励磁電流分）を除く必要があり、図4では電子回路による励磁分補償器11を用いた。ただ、この方法は、交流電源6の波形や大きさが変動すると補償が不十分になることがある。そこで、以下にこの励磁電流分の補償をより完全に行なうための方法について述べる。

【0014】図8は、補償コイル13を用いた構成を示す模式図である。図8において、交流電源6に、励磁コイル5と同等の補償コイル13，検出抵抗9と同等の補償抵抗14を直列に接続して、これらを励磁コイル5，検出抵抗9の回路に並列に接続する。この二つの回路は、回路条件が同じであるから各電流も同じである。両電流を検出抵抗9，補償抵抗14から取り出し、二つの微分器10で微分して、減算器15で両者の差にすることにより、前述の図6に示した波形と同じ波形にすることができる。図8も図7と同様、励磁コイル5，計測器8は図示を省略してある。

【0015】図9は、補償相互誘導器16を用いた構成の模式図であり、交流電源6から、励磁コイル5と検出相互誘導器12の直列回路，補償コイル13と補償相互誘導器16の直列回路にそれぞれ接続して、検出相互誘導器12と補償相互誘導器16の二次側から両回路の電流の微分値を検出し、二次側を逆向きに接続して両者の差にすることにより、前述の図6に示した波形と同じ波形にすることができる。図9では励磁コイル5の図示を省略した。図8，図9で述べた方法を用いれば、交流電源6の変動，室温の変化によるコイルや電線の抵抗値の変動があったときも、励磁電流分の補償を十分に行なうことができる。

【0016】

【発明の効果】磁性細線を有する磁気マーカーを物品に貼付して磁界を通し、磁性細線の磁束変化から物品の種類や数量を識別する磁気マーカー検出方法は、通常検出コイルを用いて行なうのであるが、本発明の方法は実施例で述べたように、励磁回路部のインピーダンスを磁性細線のインピーダンスより小さく設定し、磁気マーカーの各磁性細線の保磁力での磁束変化により励磁電流を変化させ、この電流波形変化、またはこの電流の微分波形から励磁電源微分波形を差し引いて、これらを検出信号として取り出すようにしたため、検出コイルを用いることなく、装置が簡単になるので、小さな物品の識別など使用目的に応じて、コンパクトな装置とするときに極めて利用価値が高い。

【図面の簡単な説明】

【図1】本発明の方法が適用される装置の要部構成を示す模式図

【図2】本発明の方法に用いられる磁性細線の磁気ヒステリシス曲線図

【図3】本発明の方法における磁界（励磁電流）波形図

【図4】磁界波形を微分するための装置の要部構成を示す模式図

【図5】図3の磁界波形を微分した波形図

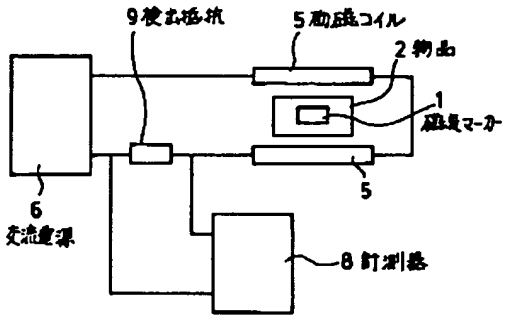
【図6】微分波形から磁界（励磁電流）波形分を除いた波形図

【図7】相互誘導器で電流を微分する本発明の方法に用いる回路構成模式図

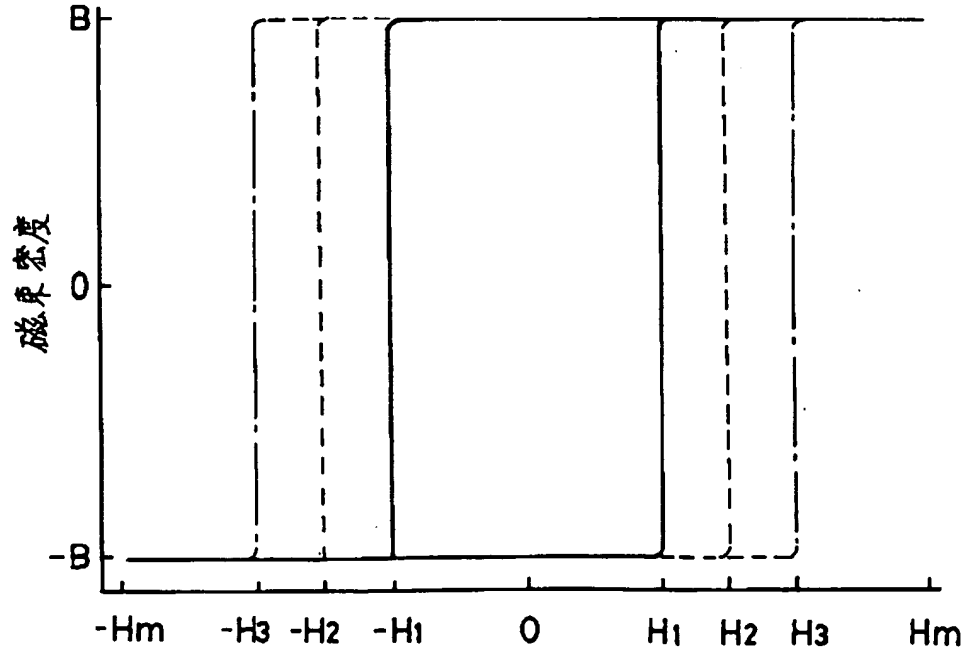
【図８】補償コイル，補償抵抗を用いて磁界（励磁電流）を補償する本発明の方法に用いる回路構成模式図
【図９】補償コイル，補償相互誘導器，検出相互誘導器を用いて磁界（励磁電流）を補償する本発明の方法に用いる回路構成模式図
【図１０】従来の物品識別装置の要部構成を示す模式図
【符号の説明】

1　磁気マーカー
2　物品
3　滑車
4　ベルト
5　励磁コイル
6　交流電源
7　検出コイル
8　計測器
9　検出抵抗
10　微分器
11　励磁分補償器
12　検出相互誘導器
13　補償コイル
14　補償抵抗
15　減算器
16　補償相互誘導器

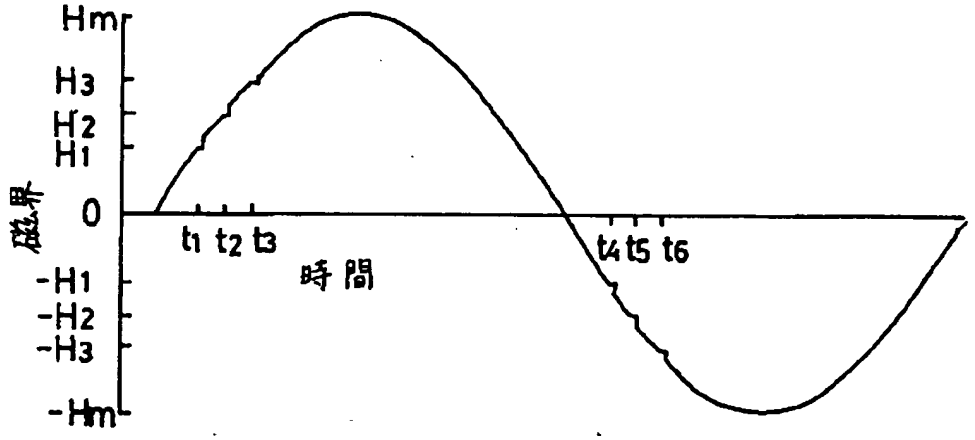
【図１】



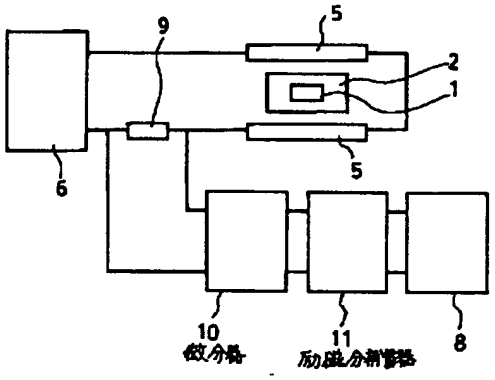
【図２】



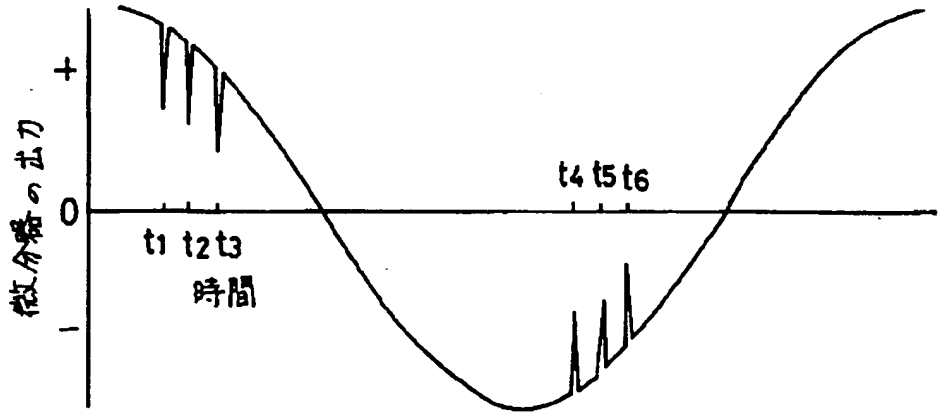
【図3】


Hm
H3
H2
H1
0
-H1
-H2
-H3
-Hm
磁界
t1 t2 t3
時間
t4 t5 t6

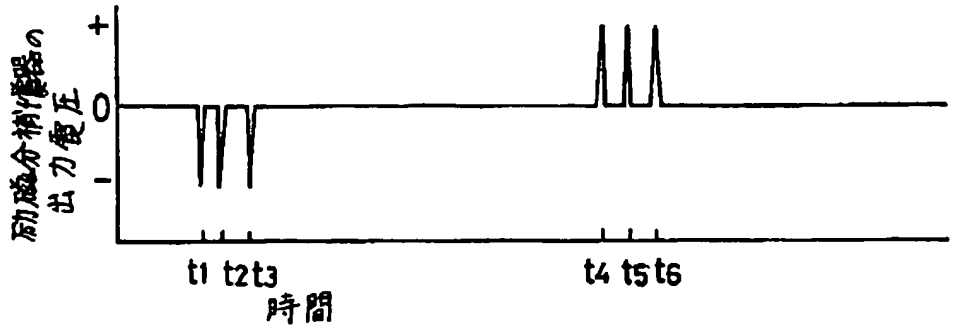
【図4】


9
5
2
1
5
6
10
微分器
11
励磁分析器
8

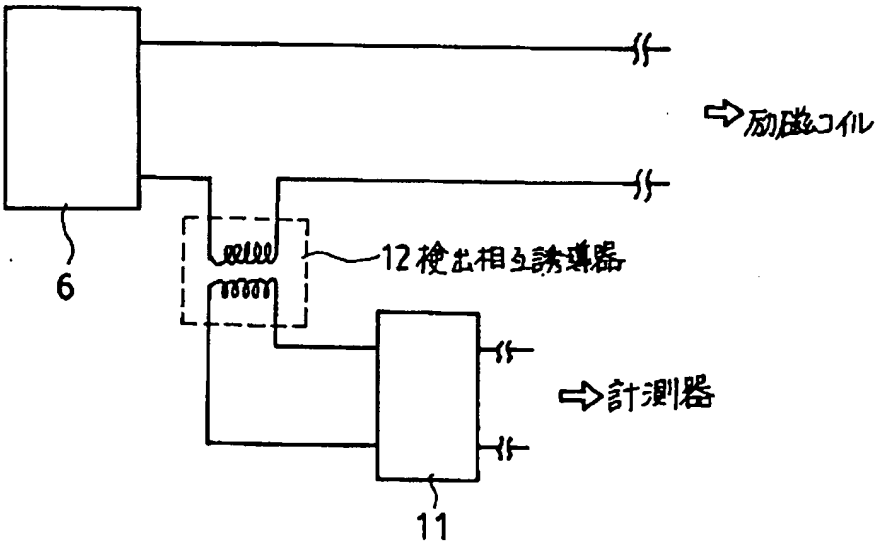
【図5】


+
0
−
微分器の出力
t1 t2 t3
時間
t4 t5 t6

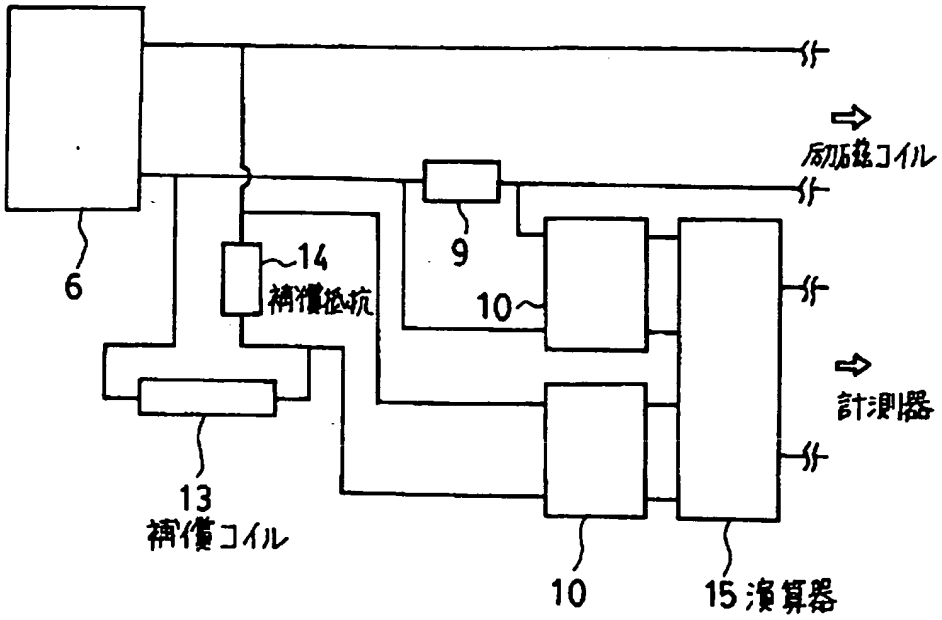
【図6】



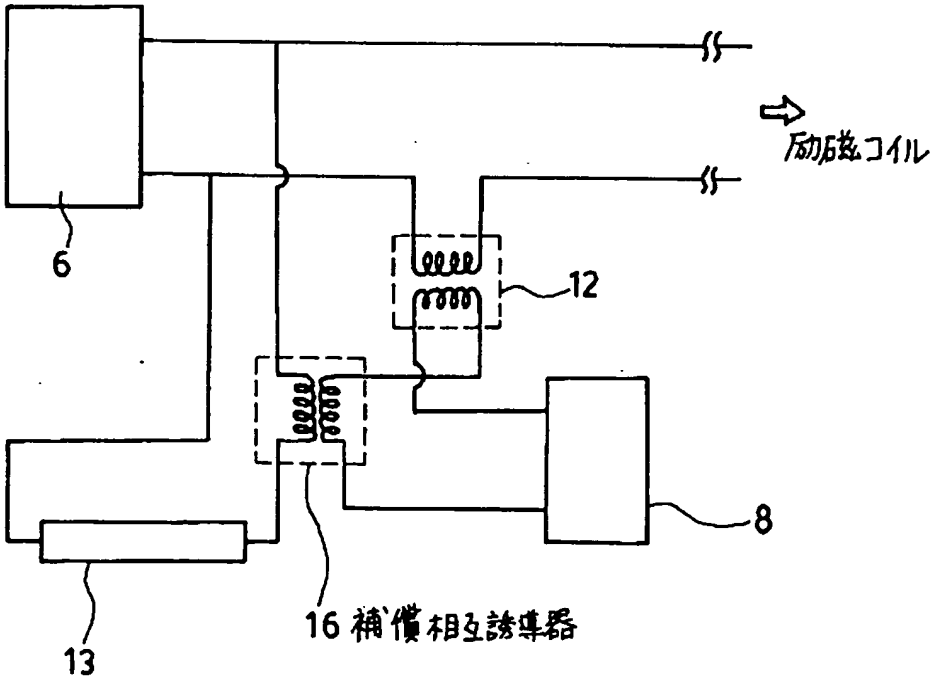
【図7】



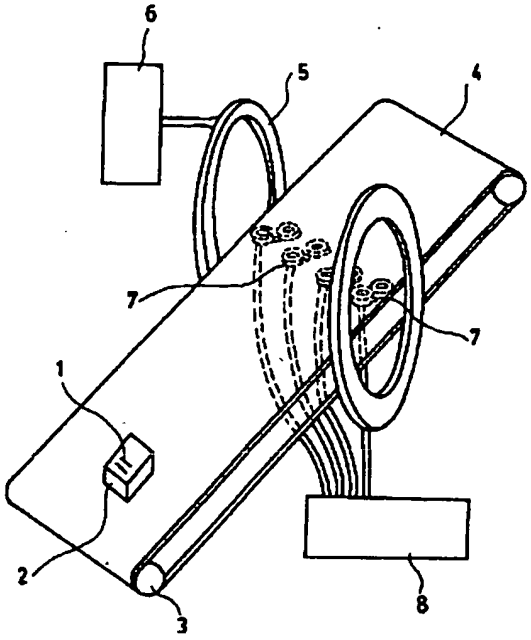
【図8】


励磁コイル
6
14
補償抵抗
9
10
計測器
13
補償コイル
10
15 演算器

【図9】


励磁コイル
6
12
8
16 補償相互誘導器
13

【図10】



CLAIMS

[Claim(s)]
[Claim 1] The method of detection of the magnetic marker characterized by setting up the impedance smaller than the impedance of a magnetic thin line, and detecting flux reversal from current wave form change of an exiting coil using the excitation circuit which consists of AC power supply, detection resistance, and an exiting coil in case a magnetic-hysteresis curve carries out ac energisation of the magnetic marker which has two or more magnetic thin lines from which square shapes are indicated to be and coercive force differs mutually and detects the flux reversal of each magnetic thin line.
[Claim 2] The method of detection of the magnetic marker characterized by to set up the impedance smaller than the impedance of a magnetic thin line, to deduct an excitation power supply differential wave from the wave which differentiated current wave form change of an exiting coil using the excitation circuit which consists of AC power supply, detection resistance, and an exiting coil, and to detect flux reversal in case a magnetic-hysteresis curve carries out ac energisation of the magnetic marker which has two or more magnetic thin lines from which square shapes are indicated to be and coercive force differs mutually and detects the flux reversal of each magnetic thin line.
[Claim 3] The method of detection of the magnetic marker characterized by connecting the compensating coil which has an impedance equivalent to an exiting coil in the excitation circuit section, and compensating an exciting-current wave in performing a method according to claim 2.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the method of detection of the magnetic marker which attaches in goods and discriminates the kind and quantity of the goods.
[0002]
[Description of the Prior Art] A coil detects the induced voltage by the magnetic flux which is made to pass through the inside of an alternating current magnetic field, and generates the goods furnished with the magnetic marker in a magnetic marker, and the method of discriminating the kind of goods is learned. Drawing 10 is the ** type view having shown the important section composition with the perspective diagram about the equipment under application by Japanese Patent Application No. No. 153274 [two to] from the same applicant as an example of a goods identification unit which used the magnetic marker. In drawing 10 , it is on the belt 4 with which the goods 2 furnished with the magnetic marker 1 are stretched by two blocks 3, and goods 2 move in the direction of an arrow on the belt 4 it runs by rotation of a block 3 with the magnetic marker 1. Two exiting coils 5 are arranged so that a belt 4 may be inserted into the run way of a belt 4 from both sides, and these exiting coils 5 are connected to AC power supply 6. Two or more sensing coils 7 prepared near the belt 4 inserted into two exiting coils 5 are connected to a measuring instrument 8. Magnetic flux changes with the alternating current magnetic fields which the magnetic marker 1 which runs a belt 4 top with goods 2 generates from an exiting coil 5. It takes out as an induced voltage which produces the flux reversal in a sensing coil 7, this is processed with a measuring instrument 8, and goods 2 are discriminated.
[0003] It is suitable to use the thin line of the amorphous magnetism alloy with which a magnetic-hysteresis curve has the large Barkhausen effect by the square shape as a magnetic marker 1. The magnetic marker 1 fixes and uses for plastics etc. two or more magnetic thin lines from which coercive force differs. Magnetic flux is rapidly reversed in time when the magnetic field by the exiting coil 5 became the value of coercive force, and pulse-like voltage carries out induction of each magnetic thin line to a sensing coil 7. The kind and quantity of goods 2 are discriminable from this induced voltage.
[0004]
[Problem(s) to be Solved by the Invention] Although the method of discriminating goods like the above using the magnetic marker of an amorphous magnetism alloy thin line is useful, since the sensing coil 7 other than an exiting coil 5 is needed and the installation position and direction of a sensing coil 7 must be further decided appropriately as the magnetic flux produced in a magnetic marker was shown in drawing 10 by the method of detecting with a coil, the whole equipment is made very complicated. Therefore, when applying to goods small, for example depending on the purpose of using a goods identification unit, it is desirable to use the method of detection of the magnetic marker which omitted the sensing coil 7, considered as compact equipment, and fitted this.
[0005] this invention is made in view of an above-mentioned point, and the purpose is in offering the method of detection of the magnetic marker which can discriminate goods from a part for current change of the exiting coil by the magnetic marker, without using a sensing coil.
[0006]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the method of this invention sets up the impedance of the excitation circuit section smaller than the impedance of a magnetic thin line, changes an exciting current by the flux reversal in the coercive force of each magnetic thin line of a magnetic marker, without using a sensing coil, deducts an excitation power supply differential wave from this current wave form change or the differential wave of this current, and makes this a detecting signal.
[0007]
[Function] In the time zone when magnetic flux is changing with the coercive force of each magnetic thin line of a magnetic marker Since it becomes the shape of a stage almost fixed [an exciting current] and small and becomes the same as an excitation power supply wave in other time zones, goods are discriminable from the existence of a stage-like wave. moreover, the differential wave of an exciting current If it becomes small toward zero and flux reversal is lost while carrying out flux reversal with coercive force, it will return to the original value and will change in the shape of a pulse. By removing a part for an excitation power supply wave from this differential wave, the voltage of the shape of a pulse suitable for the magnetic marker is obtained, and it becomes discriminable [goods] from this pulse-like voltage.
[0008]

[Example] Hereafter, the method of this invention is explained based on an example. It is shown in drawing 1 by using as a ** type view composition of the goods identification unit which applies the method of this invention, and drawing 10 and the intersection are expressed with the same sign. Although the magnetic marker 1, goods 2, the belt 4, etc. are the same as drawing 10 , in drawing 1 , between an exiting coil 5 and AC power supply 6, they connected the detection resistance 9 and have connected the ends to a measuring instrument 8. The circuit where an exciting current flows sets up smaller than the impedance of a magnetic thin line the internal impedance of AC power supply 6, the value of the detection resistance 9, and the impedance of an exiting coil 5 so that an exciting current may change with the existence of the magnetic marker 1.
[0009] Although the direction of the magnetic thin line used for the magnetic marker 1 which uses as many things from which the size of coercive force differs mutually as possible can increase the number of discernment goods, it describes the case where the magnetic thin line which is three kinds from which the size of coercive force differs is used here in order to simplify explanation. Drawing 2 is the magnetic-hysteresis curvilinear view of these magnetism thin line, and is expressed with the solid line, the dotted line, and the alternate long and short dash line, respectively. Hm The maximum of a magnetic field, and H1, H2 and H3 It is the coercive force of the magnetic thin line of each magnetic thin line.
[0010] Drawing 3 is the magnetic field wave form chart of a time zone in case the magnetic marker 1 is in the position which passes through between two exiting coils 5. Since the magnetic flux of a magnetic thin line changes rapidly by coercive force H1 (t1), H2 (t2), and H3 (t3) as shown in drawing 3 , a magnetic field, i.e., an exciting current, becomes almost fixed, and it becomes the shape of a small stage. Inside t4, t5, and t6 of drawing 3 Coercive force of a negative side - H1, -H2, and -H3 Expressing time corresponding, a wave shows the shape of a small stage like a positive side. Goods discernment is possible by distinguishing the existence of the shape of this stage.
[0011] Moreover, as for the above method, it is effective to consider as the formal detecting signal which avoided this since the measuring instrument 8 became complicated, and differentiated the magnetic field wave of drawing 3 also from the point of detection precision. Then, in addition to the equipment of drawing 1 , as shown in drawing 4 , from the ends of the detection resistance 9, it connects in series and a differentiator 10, the excitation part compensator 11, and a measuring instrument 8 are used. The output of the differentiator 10 of the wave acquired here, i.e., drawing 4 , is time t1, t2, and t3, as shown in the wave form chart of drawing 5 . And t4, t5, and t6 It changes in the shape of a pulse toward zero. Drawing 6 is the wave form chart which removed a part for a wave in case there is no magnetic marker 1 (here sine wave) from the wave of drawing 5 with the excitation part compensator 11 shown in drawing 4 , and is time t1, t2, and t3. And t4, t5, and t6 It becomes pulse-like voltage and can use as a recognition signal.
[0012] Drawing 7 is the ** type view showing the composition when differentiating a magnetic field (exciting current) using the detection mutual induction machine 12, and not using the differentiator 10 of drawing 4 . However, the exiting coil 5 and the measuring instrument 8 have omitted illustration. The detection mutual induction machine 12 needs to make the resistance of an upstream, and a reactance as small as possible in order to make an impedance small. The output at this time becomes equivalent to the wave shown in drawing 5 .
[0013] As mentioned above, the method of this invention needed to remove a part for a magnetic field in case the magnetic marker 1 does not pass along between exiting coils 5 (a part for an exciting current), and the excitation part compensator 11 by the electronic circuitry was used for it by drawing 4 . However, as for this method, when the wave and size of AC power supply 6 are changed, compensation has a bird clapper insufficiently. Then, the method for compensating below for a part for this exciting current more completely is described.
[0014] Drawing 8 is the ** type view showing the composition which used the compensating coil 13. In drawing 8 , the compensating coil 13 equivalent to an exiting coil 5 and the compensation resistor 14 equivalent to the detection resistance 9 are connected to AC power supply 6 in series, and these are connected to it in parallel with the circuit of an exiting coil 5 and the detection resistance 9. Since these two circuits have the the same circuit conditions, its same is said of each current. It can be made the same wave as the wave shown in above-mentioned drawing 6 by taking out both current from the detection resistance 9 and a compensation resistor 14, differentiating with two differentiators 10, and making it both difference by the subtractor 15. The exiting coil 5 and the measuring instrument 8 have omitted illustration like [drawing 8] drawing 7 .
[0015] Drawing 9 is the ** type view of composition of having used the compensation mutual induction machine 16, and is connected from AC power supply 6 at the series circuit of an exiting coil 5, the series circuit of the detection mutual induction machine 12 and a compensating coil 13, and the compensation mutual induction machine 16, respectively. It can be made the same wave as the wave shown in above-mentioned drawing 6 by detecting the differential value of the current of both circuits from secondary [of the detection mutual induction machine 12 and the compensation mutual induction machine 16], connecting secondary to a retrose, and making it both difference. Illustration of an exiting coil 5 was omitted in drawing 9 . When using the method stated by drawing 8 and drawing 9 and there are change of AC power supply 6 and change of the resistance of the coil by change of a room temperature or an electric wire, a part for an exciting current can fully be compensated.
[0016]
[Effect of the Invention] Although the magnetic marker which has a magnetic thin line is stuck on goods and the magnetic marker method of detection which discriminates the kind and quantity of goods from the flux reversal of through and a magnetic thin line usually performs a magnetic field using a sensing coil As the example described the method of this invention, the impedance of the excitation circuit section is set up smaller than the impedance of a magnetic thin line. Since an exciting current is changed by the flux reversal in the coercive force of each magnetic thin line of a magnetic marker, an excitation power supply differential wave is deducted from this current wave form change or the differential wave of this

current and these were taken out as a detecting signal, Utility value is very high, when considering as compact equipment according to the purposes of use, such as discernment of small goods, without using a sensing coil, since equipment becomes easy.

[Translation done.]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Industrial Application] this invention relates to the method of detection of the magnetic marker which attaches in goods and discriminates the kind and quantity of the goods.

[Translation done.]

PRIOR ART

[Description of the Prior Art] A coil detects the induced voltage by the magnetic flux which is made to pass through the inside of an alternating current magnetic field, and generates the goods furnished with the magnetic marker in a magnetic marker, and the method of discriminating the kind of goods is learned. Drawing 10 is the ** type view having shown the important section composition with the perspective diagram about the equipment under application by Japanese Patent Application No. No. 153274 [two to] from the same applicant as an example of a goods identification unit which used the magnetic marker. In drawing 10 , it is on the belt 4 with which the goods 2 furnished with the magnetic marker 1 are stretched by two blocks 3, and goods 2 move in the direction of an arrow on the belt 4 it runs by rotation of a block 3 with the magnetic marker 1. Two exiting coils 5 are arranged so that a belt 4 may be inserted into the run way of a belt 4 from both sides, and these exiting coils 5 are connected to AC power supply 6. Two or more sensing coils 7 prepared near the belt 4 inserted into two exiting coils 5 are connected to a measuring instrument 8. Magnetic flux changes with the alternating current magnetic fields which the magnetic marker 1 which runs a belt 4 top with goods 2 generates from an exiting coil 5. It takes out as an induced voltage which produces the flux reversal in a sensing coil 7, this is processed with a measuring instrument 8, and goods 2 are discriminated.

[0003] It is suitable to use the thin line of the amorphous magnetism alloy with which a magnetic-hysteresis curve has the large Barkhausen effect by the square shape as a magnetic marker 1. The magnetic marker 1 fixes and uses for plastics etc. two or more magnetic thin lines from which coercive force differs. Magnetic flux is rapidly reversed in time when the magnetic field by the exiting coil 5 became the value of coercive force, and pulse-like voltage carries out induction of each magnetic thin line to a sensing coil 7. The kind and quantity of goods 2 are discriminable from this induced voltage.

[Translation done.]

* NOTICES *

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3.In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[Effect of the Invention] The magnetic marker method of detection which sticks the magnetic marker which has a magnetic thin line on goods, and discriminates the kind and quantity of goods for a magnetic field from the flux reversal of through and a magnetic thin line, Usually, although carried out using a sensing coil As the example described the method of this invention, the impedance of the excitation circuit section is set up smaller than the impedance of a magnetic thin line. Since an exciting current is changed by the flux reversal in the coercive force of each magnetic thin line of a magnetic marker, an excitation power supply differential wave is deducted from this current wave form change or the differential wave of this current and these were taken out as a detecting signal, Utility value is very high, when considering as compact equipment according to the purposes of use, such as discernment of small goods, without using a sensing coil, since equipment becomes easy.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Although the method of discriminating goods like the above using the magnetic marker of an amorphous magnetism alloy thin line is useful, since the sensing coil 7 other than an exiting coil 5 is needed and the installation position and direction of a sensing coil 7 must be further decided appropriately as the magnetic flux produced in a magnetic marker was shown in drawing 10 by the method of detecting with a coil, the whole equipment is made very complicated. Therefore, when applying to goods small, for example depending on the purpose of using a goods identification unit, it is desirable to use the method of detection of the magnetic marker which omitted the sensing coil 7, considered as compact equipment, and fitted this.
[0005] this invention is made in view of an above-mentioned point, and the purpose is in offering the method of detection of the magnetic marker which can discriminate goods from a part for current change of the exiting coil by the magnetic marker, without using a sensing coil.

[Translation done.]

MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the method of this invention sets up the impedance of the excitation circuit section smaller than the impedance of a magnetic thin line, changes an exciting current by the flux reversal in the coercive force of each magnetic thin line of a magnetic marker, without using a sensing coil, deducts an excitation power supply differential wave from this current wave form change or the differential wave of this current, and makes this a detecting signal.

[Translation done.]

OPERATION

[Function] In the time zone when magnetic flux is changing with the coercive force of each magnetic thin line of a magnetic marker Since it becomes the shape of a stage almost fixed [an exciting current] and small and becomes the same as an excitation power supply wave in other time zones, goods are discriminable from the existence of a stage-like wave, and while carrying out flux reversal with coercive force, the differential wave of an exciting current will return to the original value, if it becomes small toward zero and flux reversal is lost, and it changes in the shape of a pulse. By removing a part for an excitation power supply wave from this differential wave, the voltage of the shape of a pulse suitable for the magnetic marker is obtained, and it becomes discriminable [goods] from this pulse-like voltage.

[Translation done.]

EXAMPLE

[Example] Hereafter, the method of this invention is explained based on an example. It is shown in drawing 1 by using as a ** type view composition of the goods identification unit which applies the method of this invention, and drawing 10 and the intersection are expressed with the same sign. Although the magnetic marker 1, goods 2, the belt 4, etc. are the same as drawing 10 , in drawing 1 , between an exiting coil 5 and AC power supply 6, they connected the detection resistance 9 and have connected the ends to a measuring instrument 8. The circuit where an exciting current flows sets up smaller than the impedance of a magnetic thin line the internal impedance of AC power supply 6, the value of the detection resistance 9, and the impedance of an exiting coil 5 so that an exciting current may change with the existence of the magnetic marker 1.
[0009] Although the direction of the magnetic thin line used for the magnetic marker 1 which uses as many things from which the size of coercive force differs mutually as possible can increase the number of discernment goods, it describes the case where the magnetic thin line which is three kinds from which the size of coercive force differs is used here in order to simplify explanation. Drawing 2 is the magnetic-hysteresis curvilinear view of these magnetism thin line, and is expressed with the solid line, the dotted line, and the alternate long and short dash line, respectively. Hm The maximum of a magnetic field, and H1, H2 and H3 It is the coercive force of the magnetic thin line of each magnetic thin line.
[0010] Drawing 3 is the magnetic field wave form chart of a time zone in case the magnetic marker 1 is in the position which passes through between two exiting coils 5. Since the magnetic flux of a magnetic thin line changes rapidly by coercive force H1 (t1), H2 (t2), and H3 (t3) as shown in drawing 3 , a magnetic field, i.e., an exciting current, becomes almost fixed, and it becomes the shape of a small stage. Inside t4, t5, and t6 of drawing 3 Coercive force of a negative side - H1, -H2, and -H3 Expressing time corresponding, a wave shows the shape of a small stage like a positive side. Goods discernment is possible by distinguishing the existence of the shape of this stage.
[0011] Moreover, as for the above method, it is effective to consider as the formal detecting signal which avoided this since the measuring instrument 8 became complicated, and differentiated the magnetic field wave of drawing 3 also from the point of detection precision. Then, in addition to the equipment of drawing 1 , as shown in drawing 4 , from the ends of the detection resistance 9, it connects in series and a differentiator 10, the excitation part compensator 11, and a measuring instrument 8 are used. The output of the differentiator 10 of the wave acquired here, i.e., drawing 4 , is time t1, t2, and t3, as shown in the wave form chart of drawing 5 . And t4, t5, and t6 It changes in the shape of a pulse toward zero. Drawing 6 is the wave form chart which removed a part for a wave in case there is no magnetic marker 1 (here sine wave) from the wave of drawing 5 with the excitation part compensator 11 shown in drawing 4 , and is time t1, t2, and t3. And t4, t5, and t6 It becomes pulse-like voltage and can use as a recognition signal.
[0012] Drawing 7 is the ** type view showing the composition when differentiating a magnetic field (exciting current) using the detection mutual induction machine 12, and not using the differentiator 10 of drawing 4 . However, the exiting coil 5 and the measuring instrument 8 have omitted illustration. The detection mutual induction machine 12 needs to make the resistance of an upstream, and a reactance as small as possible in order to make an impedance small. The output at this time becomes equivalent to the wave shown in drawing 5 .
[0013] As mentioned above, the method of this invention needed to remove a part for a magnetic field in case the magnetic marker 1 does not pass along between exiting coils 5 (a part for an exciting current), and the excitation part compensator 11 by the electronic circuitry was used for it by drawing 4 . However, as for this method, when the wave and size of AC power supply 6 are changed, compensation has a bird clapper insufficiently. Then, the method for compensating below for a part for this exciting current more completely is described.
[0014] Drawing 8 is the ** type view showing the composition which used the compensating coil 13. In drawing 8 , the compensating coil 13 equivalent to an exiting coil 5 and the compensation resistor 14 equivalent to the detection resistance 9 are connected to AC power supply 6 in series, and these are connected to it in parallel with the circuit of an exiting coil 5 and the detection resistance 9. Since these two circuits have the the same circuit conditions, its same is said of each current. It can be made the same wave as the wave shown in above-mentioned drawing 6 by taking out both current from the detection resistance 9 and a compensation resistor 14, differentiating with two differentiators 10, and making it both difference by the subtractor 15. The exiting coil 5 and the measuring instrument 8 have omitted illustration like [drawing 8] drawing 7 .
[0015] Drawing 9 is the ** type view of composition of having used the compensation mutual induction machine 16, and is connected from AC power supply 6 at the series circuit of an exiting coil 5, the series circuit of the detection mutual induction machine 12 and a compensating coil 13, and the compensation mutual induction machine 16, respectively. It can be made the same wave as the wave shown in above-mentioned drawing 6 by detecting the differential value of the current of both circuits

from secondary [of the detection mutual induction machine 12 and the compensation mutual induction machine 16], connecting secondary to a retrose, and making it both difference. Illustration of an exiting coil 5 was omitted in drawing 9 . When using the method stated by drawing 8 and drawing 9 and there are change of AC power supply 6 and change of the resistance of the coil by change of a room temperature or an electric wire, a part for an exciting current can fully be compensated.

[Translation done.]

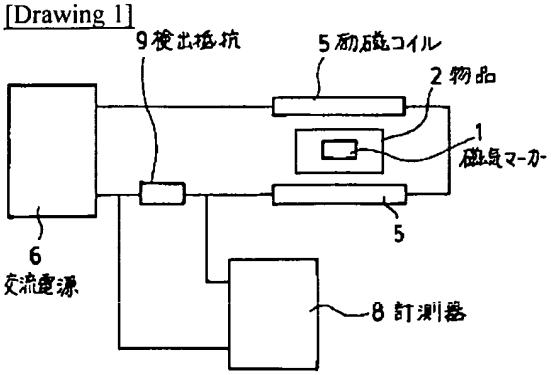
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The ** type view showing the important section composition of the equipment with which the method of this invention is applied
[Drawing 2] The magnetic-hysteresis curvilinear view of a magnetic thin line used for the method of this invention
[Drawing 3] The magnetic field (exciting current) wave form chart in the method of this invention
[Drawing 4] The ** type view showing the important section composition of the equipment for differentiating a magnetic field wave
[Drawing 5] The wave form chart which differentiated the magnetic field wave of drawing 3
[Drawing 6] The wave form chart except a part for the magnetic field (exciting current) wave from a differential wave
[Drawing 7] The ********** type view used for the method of this invention of differentiating current with a mutual induction vessel
[Drawing 8] A compensating coil, the ********** type view used for the method of this invention of compensating a magnetic field (exciting current) using a compensation resistor
[Drawing 9] The ********** type view used for the method of this invention of compensating a magnetic field (exciting current) using a compensating coil, a compensation mutual induction machine, and a detection mutual induction machine
[Drawing 10] The ** type view showing the important section composition of the conventional goods identification unit
[Description of Notations]
1 Magnetic Marker
2 Goods
3 Block
4 Belt
5 Exiting Coil
6 AC Power Supply
7 Sensing Coil
8 Measuring Instrument
9 Detection Resistance
10 Differentiator
11 Excitation Part Compensator
12 Detection Mutual Induction Machine
13 Compensating Coil
14 Compensation Resistor
15 Subtractor
16 Compensation Mutual Induction Machine

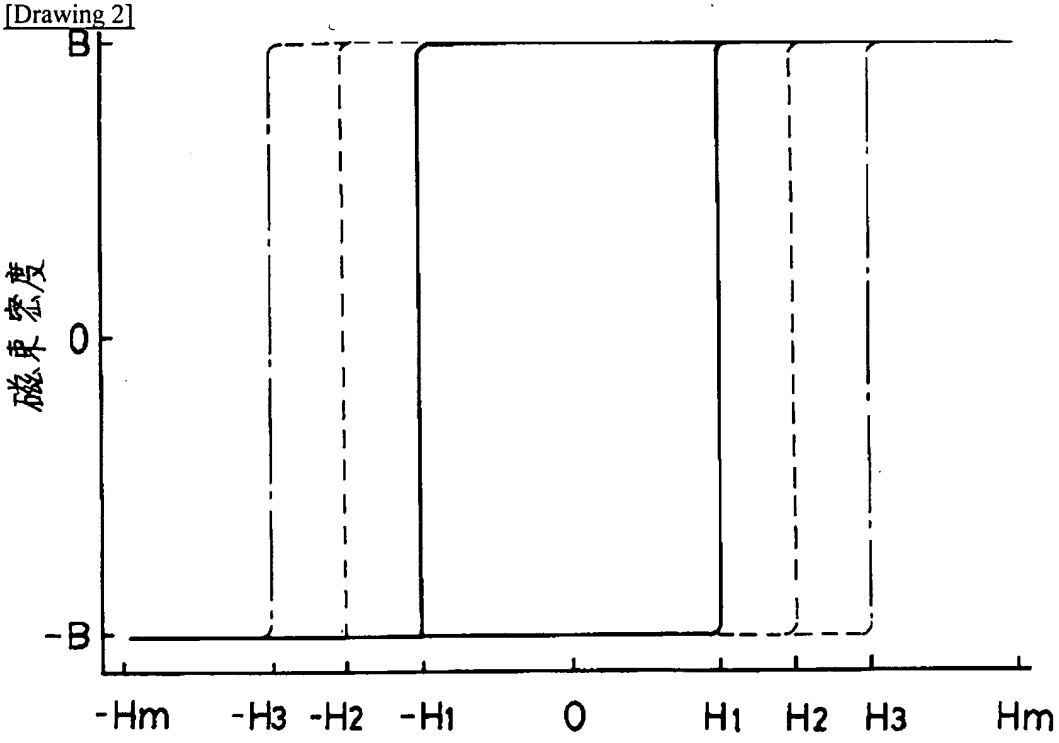
[Translation done.]

DRAWINGS

[Drawing 1]



[Drawing 2]



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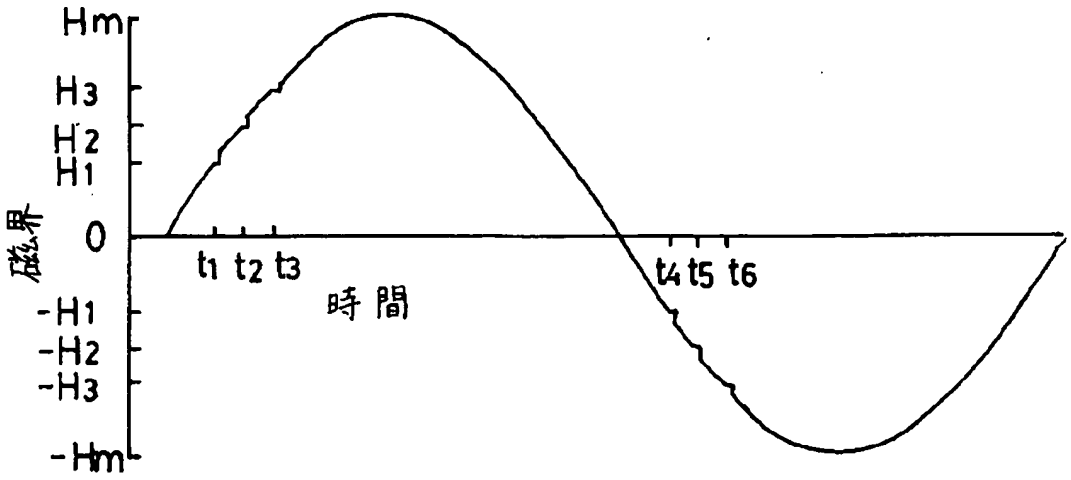
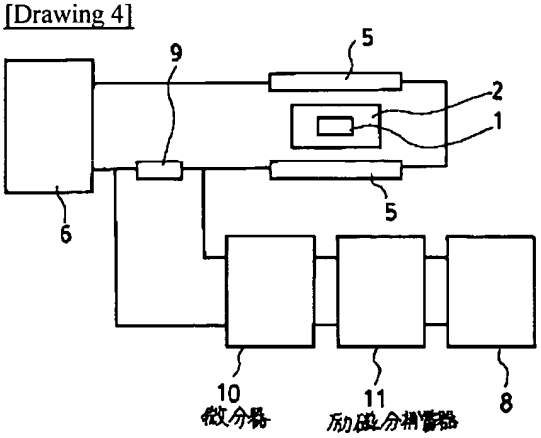


[Drawing 4]



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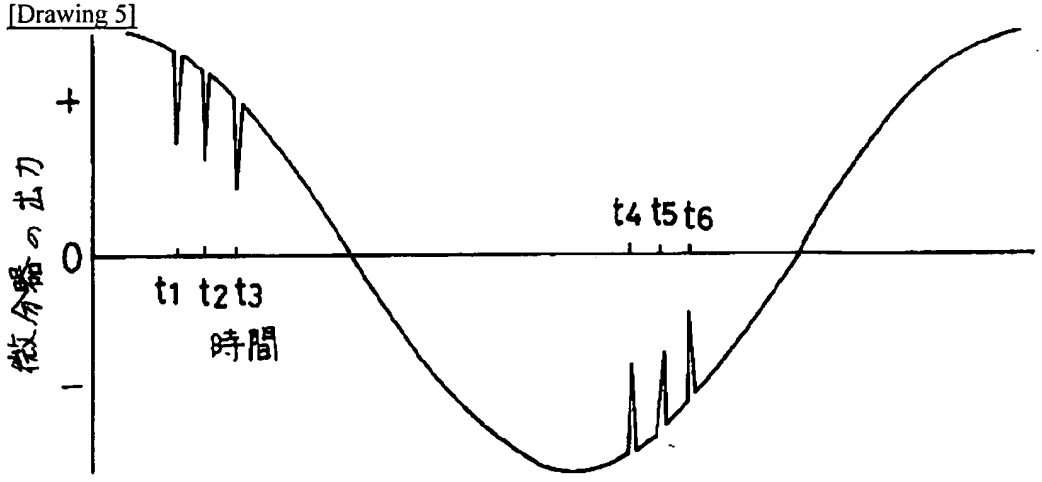
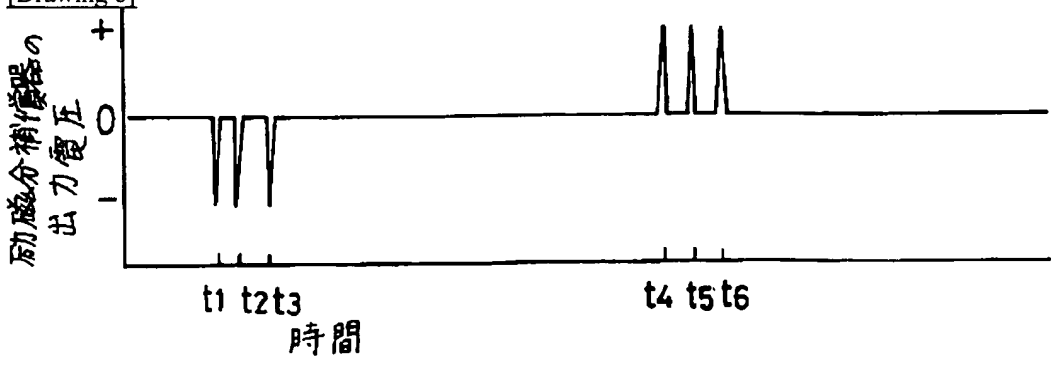
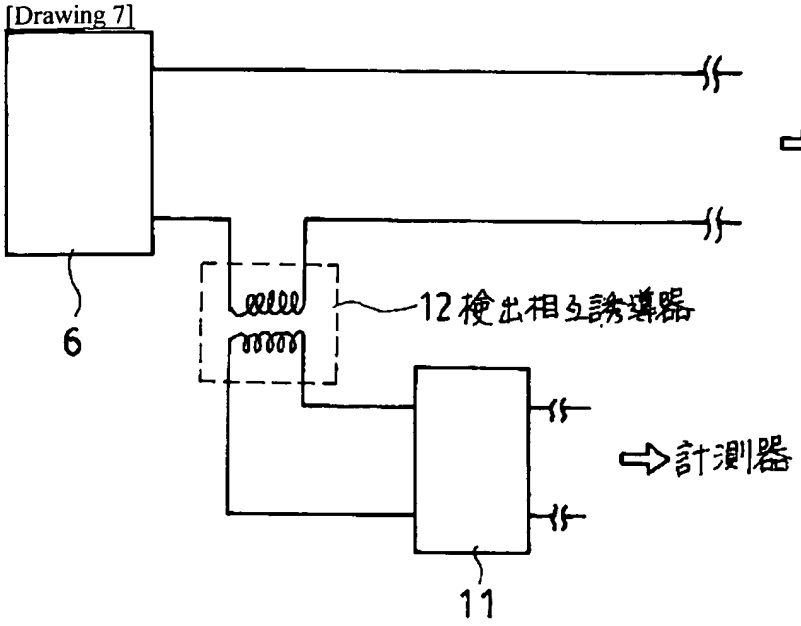


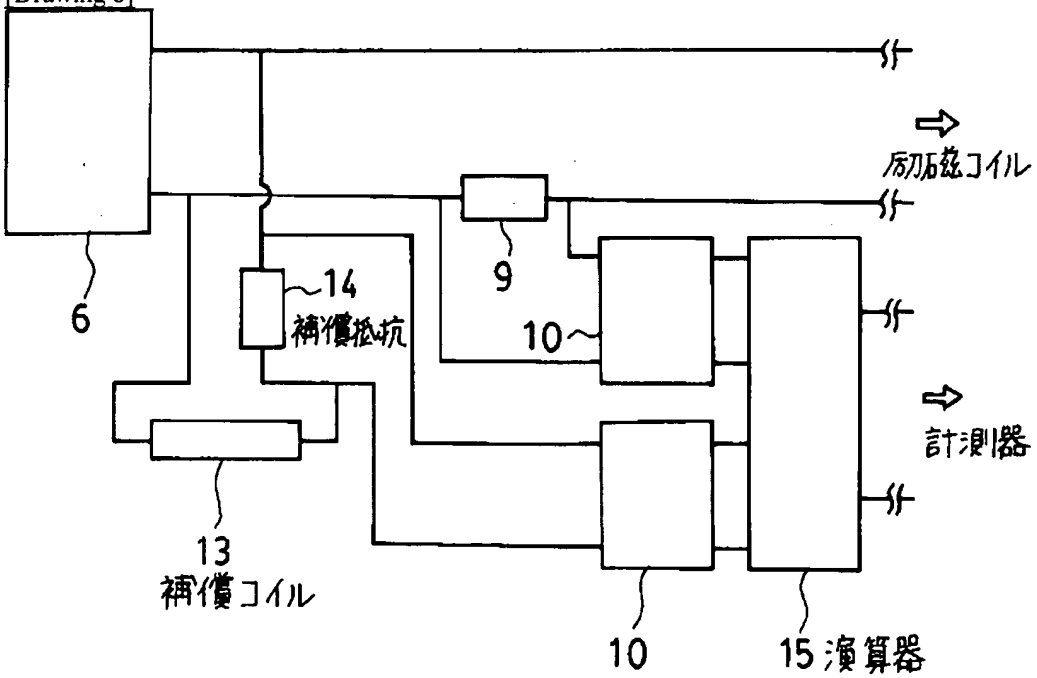
[Drawing 6]



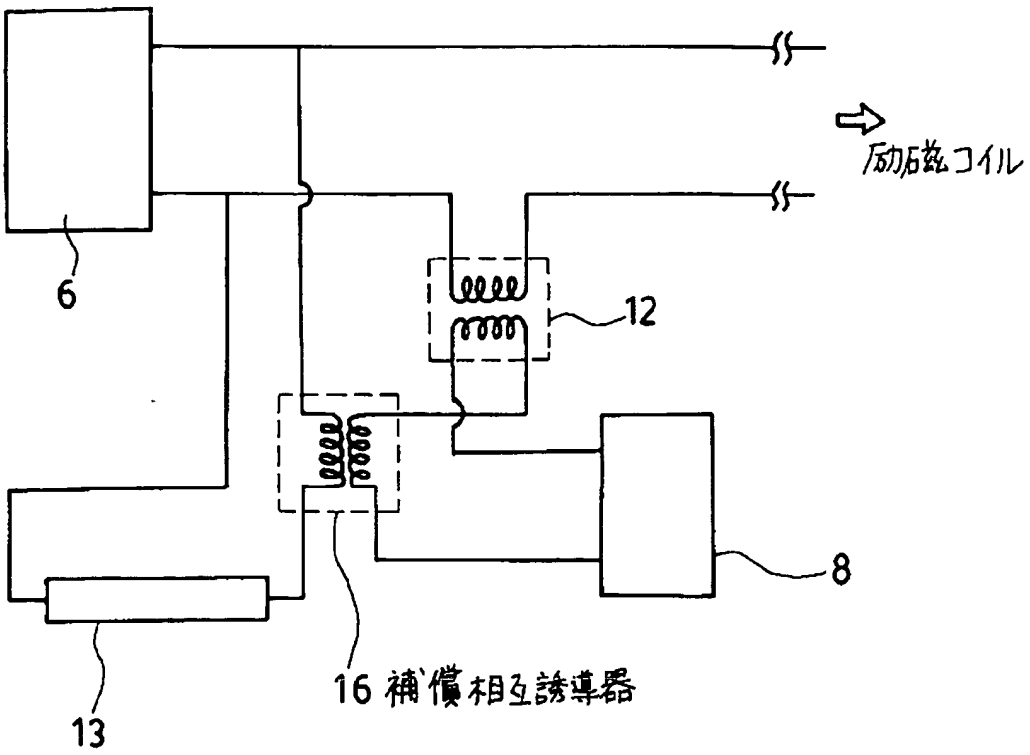
[Drawing 7]



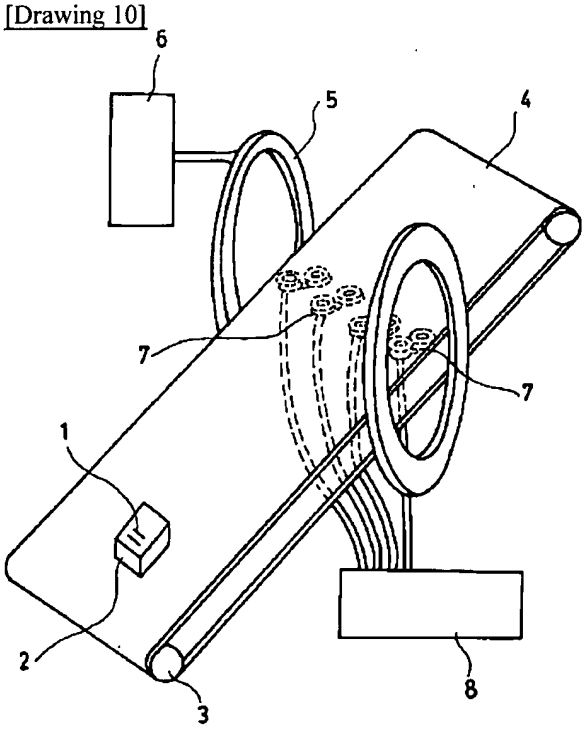
[Drawing 8]



[Drawing 9]



[Drawing 10]



[Translation done.]